Question 2: Currency Hedging Analysis

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Abstract

In this question I attempt to replicate the results found in a study that focuses on currency hedging. Secondly I complete my own analysis where I find that a hedged portfolio holds more volatility thus risk compared to a unhedged portfolio.

1. Introduction

The purpose of the question is two fold. The first section of this question involves attempting to replicate the results shown in a study referring to, "currency hedging - and that there is a paradox in volatility in that negatively correlated assets may produce portfolio volatilities that are lower than the sum of its parts". I am unable to fully replicate the findings of the study but i do however plot the scatter plots illustrating the relationship between the ZAR/US exchange rate and a hedged and unhedged portfolio following a portfolio structure of a 60/40 split between equities and bonds and a 70/30 split between global and local.

The second part of this question I do my own analysis involving the portfolio above and study the volatility comparison of the hedged and unhedged portfolio> In this section I illustrate how the hedged portfolio has far greater volatility than then unhedged portfolio. Thus, which leads the case for not applying long-term (systematic) currency hedging.

1.1. Loading relevant data

The relevant data is data involves the monthly returns for, MSCI_ACWI, Bbg_Agg, J433, ALBI and the ZAR/USD exchange rate.

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1.2. Data preperation

To prepare the data I first merge the monthly returns with the exchange rate data frame> I then find that there are some NA's present which I deal with accordingly. With respect to the NA's present in the values column I fill with the last available value, Which I feel is the most appropriate manner to deal with the NA's. I then also convert the capped SWIX(J433) and ALBI from ZAR to USD for ease of calculation.

1.3. Lets now try create the portfolio

1.3.1. Portfolio weights

I create the weights for the portfolio using the portfolio construction stated in the question. A 60/40 split between equity and bonds, and a 70/30 split between local and global.

1.3.2. Unhedged and hedged portfolio construction

Here I calculate the returns of the hedged and unhedged portfolios by multiply the specific returns with the accompanying weight vector

1.4. Attempted Study replication

Within this section of the question, I attempt to replicate the results of the study, although I am not able to fully replicate the paper, I am able to create some interesting scatter plots where I evaluate the relationship between the hedged and unhedged portfolios with the ZAR/USD exchange rate.

1.4.1. Unhedged scatter plot

The unhedged scatter plot illustrates a sightly negative correlation between the ZAR/USD exchange rate and the unhedged portfolio return. This is inline with the findings of the study mentioned in the question.

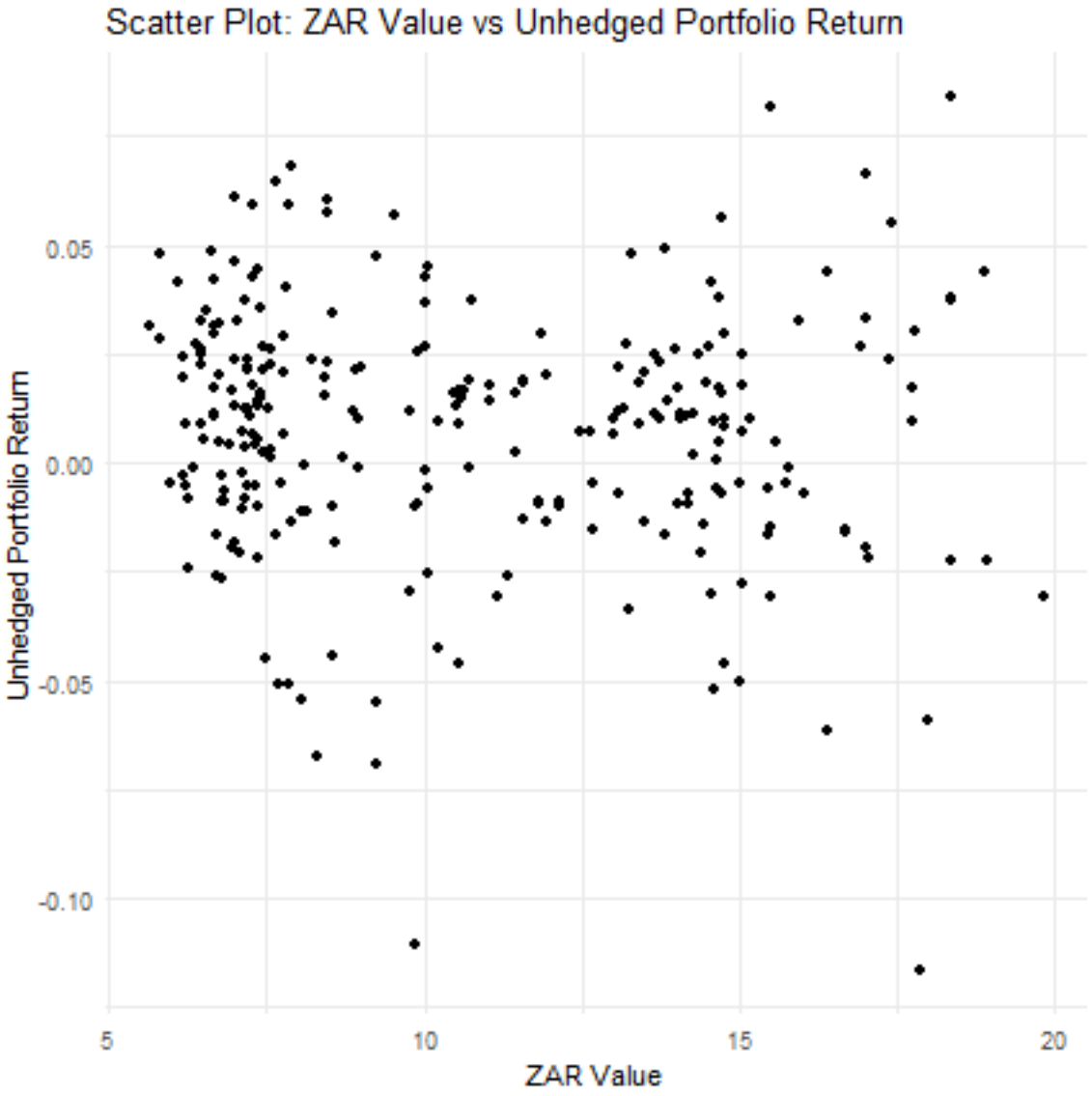


Figure 1.1: Unhedged vs ZAR/USD scatter plot

1.4.2. Hedged scatterplot

The findings of the hedged portfolio like that of the unhedged portfolio, find a negative relationship between the ZAR/USD exchange rate and the hedged portfolio returns. Which again is inline with the findings of the study mentioned in the question.

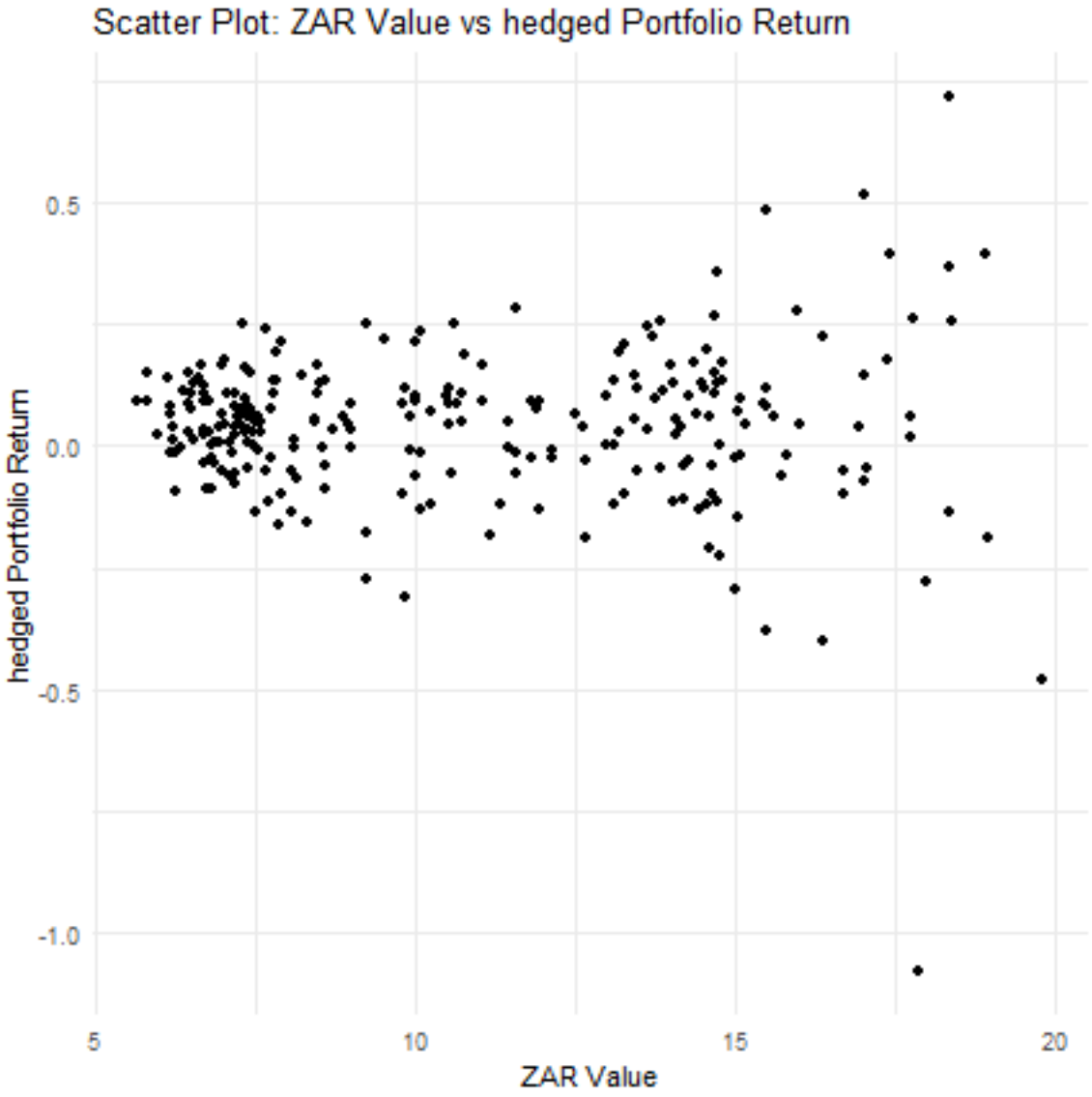


Figure 1.2: hedged vs ZAR/USD scatter plot

From the analysis completed above it is evident that there is a case for not applying long-term (systematic) currency hedging to your portfolio. To further unpack this statement I dive into my own analysis.

1.5. Own study

In this section of the question I dive into my own study. I evaluate a comparison between the volatility of a hedge vs unhedged portfolio.

1.6. Comparison of Hedged vs Unhedged Portfolio Returns

TO start of this comparison I first run a line graph showing the returns of the hedged portfolio vs the returns of the unhedged portfolio. The results further strengthen the statements made prior that the hedged portfolio returns induce greater volatility than that of the unhedged portfolio. To further unpack this discussion on volatility comparison I use the PerformanceAnalytics package in R to fully evaluate the volatility of the portfolios in question.

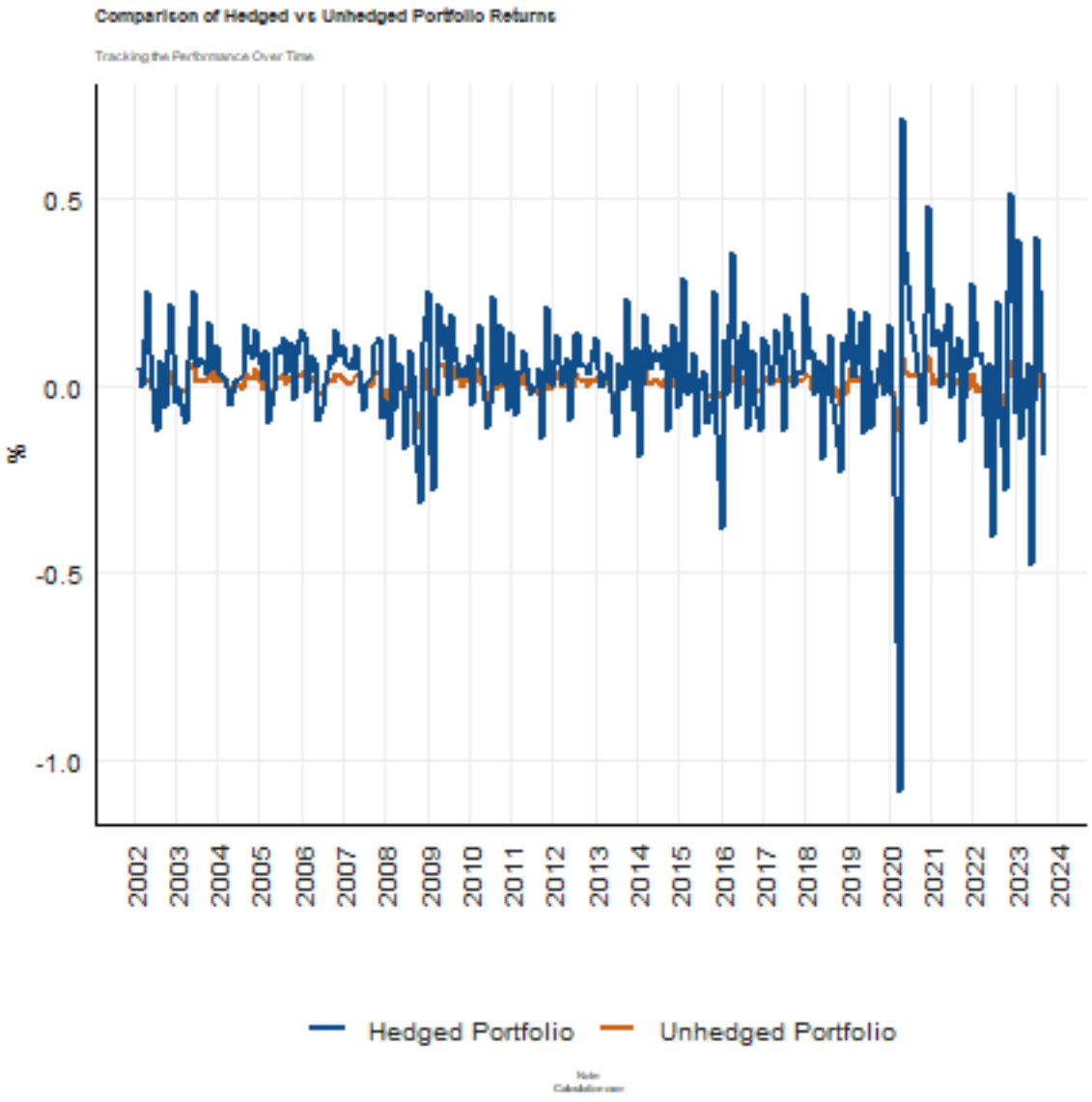


Figure 1.3: hedging comparisson plot

1.7. Understanding the volatility of the hedged vs unhedged portfolios

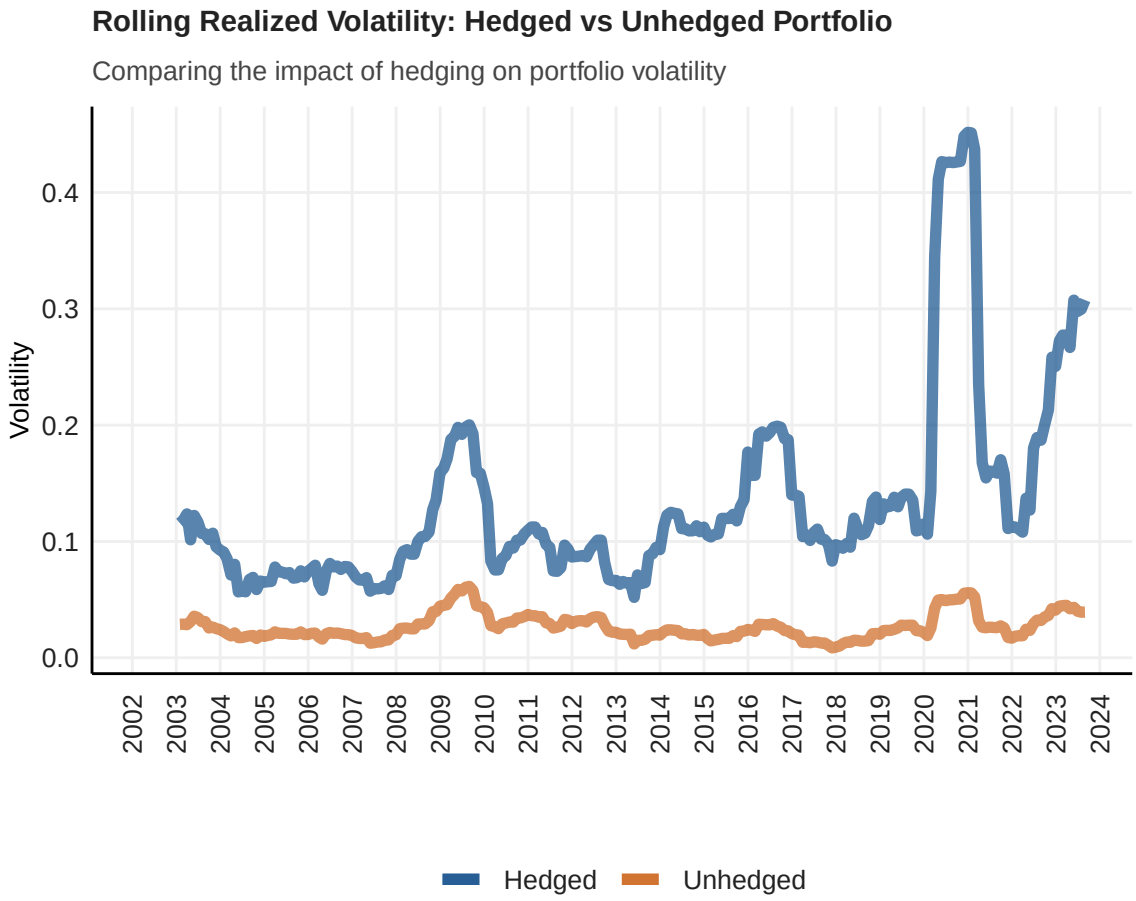
In this section I calculate the rolling volatility and plot the results for the hedged vs unhedged portfolios. To further the analysis I evaluate a rolling period of 1 year with one of 3 years.

1.7.1. Calculating the rolling volatility

Using the performance analytics package in R I am able to calculate the 1 year rolling volatility.

1.7.2. Rolling Realized Volatility: Hedged vs Unhedged Portfolio plot

Here I plot a comparison of the rolling 1 year realized volatility of the hedged vs unhedged portfolio using a line graph. As expected the hedged portfolio continues to be accompanied by higher volatility compared to that of the unhedged portfolio. To evaluate whether this is just the case with the 1 year rolling volatility I evaluate the 3 year rolling volatility next.



Note: Own calculation

1.8. Lets now consider a longer rolling term of three years and evaluate its impact on valatility

Now considering a longer rolling term of three years I evaluate whether the hedged portfolio still contains higher volatility compared to that of the unhedged portfolio.

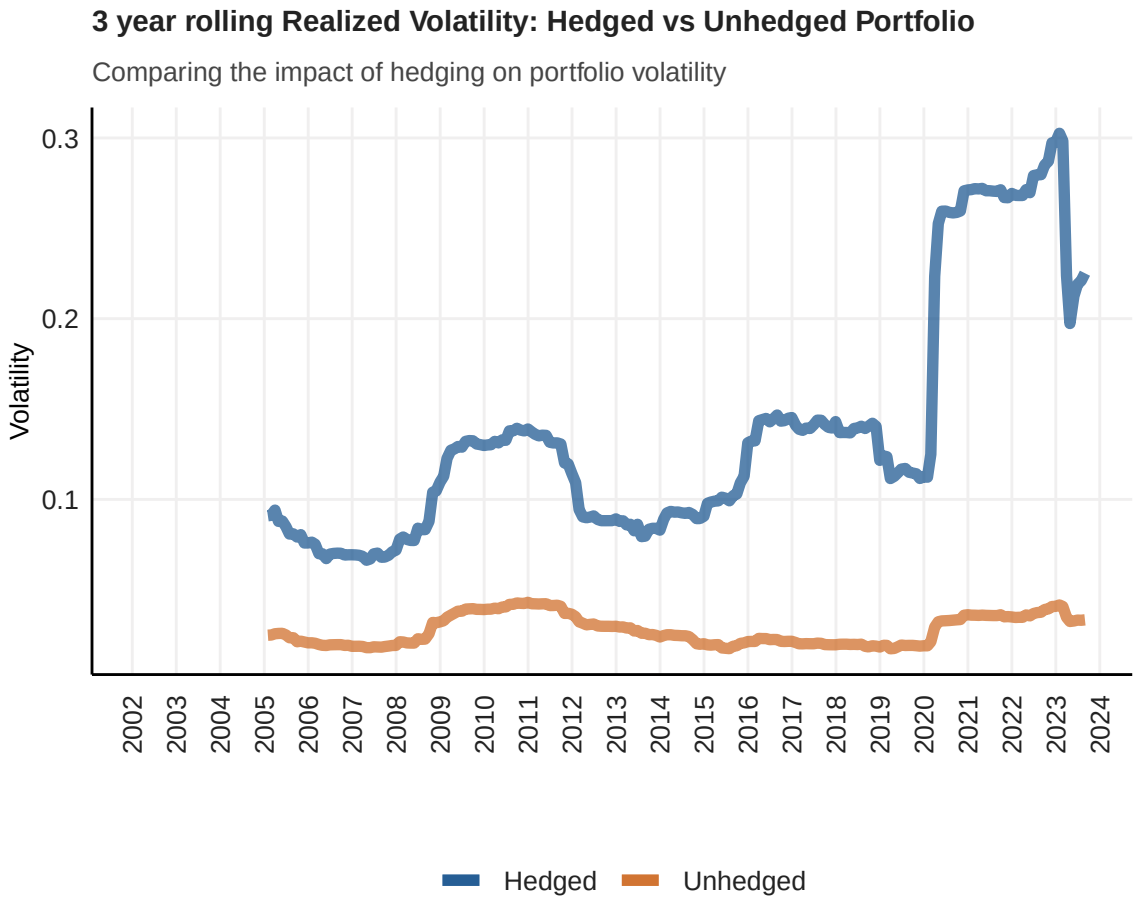
1.8.1. Calculating rolling volatility using 36 months

I calculate the 3 year rolling volatility for both the hedged and unhedged portfolios.

1.8.2. 3 year rolling realized volatility: Hedged vs Unhedged Portfolio plot

By utilizing the same methods as was used in calculating the 1 year rolling realized volatility I am able to calculate the three year rolling realized volatility and plot the results.

Once again it is evident that the hedged portfolio contains higher volatility and therefore risk than that of the unhedged portfolio. The 3 year rolling return results in lower volatility than that of the 1 year rolling volatility for the portfolios which can be expected due to increased time period.



Note: Own calculation

1.9. Conclusion

Thus, from the analysis completed above it is evident that the hedging your portfolio to reduce risk may not be the appropriate way at tackling risk. Hedging your portfolio may actually induce more volatility resulting in higher risk.

References

Appendix

Appendix A

Some appendix information here

Appendix B